

Dr. Brinton was appointed to prepare an obituary notice of the deceased.

The death of Dr. John W. Draper, on Jan. 4, 1882, aged 71 years, was announced.

Dr. Hammond was appointed to prepare an obituary notice of the deceased.

An obituary notice of Mr. W. Milnor Roberts was read.

Prof. Cope presented a fossil lower jaw from the Colorado basin.

Nominations were read.

Mr. Lesley was nominated Librarian.

The report of the Finance Committee was submitted.

The Committee on the Deposit of MSS. reported progress.

And the meeting was adjourned.

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*An Obituary Notice of William Milnor Roberts.*

*(Furnished by Mrs. W. Milnor Roberts, and read before the American Philosophical Society, by Frederick Fraley, January 6, 1882.)*

William Milnor Roberts, C. E., whose death occurred at Soledade, province of Minas Geraes, July 14th, 1881, was one of the oldest and most active members of the engineering profession. He was of Quaker descent, and was born in the city of Philadelphia on the 12th of February, 1810. His education was received in the best private schools of that city, during which a special course in mathematics of two terms was spent under the eminent mathematician, Joseph Roberts. He also pursued a course of architectural drawing in the first school established by the Franklin Institute, under the distinguished architect, John Haviland. After entering the profession of engineering—there were no engineering schools at that time—he continued his studies, principally in mathematics, of which he was very fond, during the winter months, the summer being spent in the field.

Owing to his aptitude for mathematical studies and investigations, his father's friend, Samuel Mifflin, then president of the Union canal company, of Pennsylvania, advised his adoption of the profession of civil engineering, an advice which he very wisely followed. He received his first employment in that profession on the Union canal, of Pennsylvania, in the spring of 1825, he being then in his sixteenth year. His first employment

was that of a chainman, his employer was the eminent canal engineer, Canvass White, and the chief of the party to which he was attached was Sylvester Welch. His progress in his profession from that time is shown by the fact that at the age of eighteen he was promoted by Mr. White to the charge of the most difficult section of the Lehigh canal, extending from Mauch Chunk down for a distance of sixteen miles. In 1829 he published a description of the Lehigh canal in *Hazard's Register*.

It was Mr. Roberts' rare good fortune to have been connected with the first railway enterprises in the United States, his career as an engineer being thus contemporaneous with the beginnings and growth of that greatest of agents in our modern civilization. Railway engineering in the United States began, in a crude way, in 1826 at the Quincy granite quarry, a tramway being then constructed for the transportation of stone from the quarry to the water, a distance of three or four miles. The first railway of any consequence, however, was the Mauch Chunk gravity road, nine miles in length, between the summit of Broad Top mountain and the head of the Mauch Chunk inclined plane. The first passenger car in the United States was put on this road in the early summer of 1827, and Mr. Roberts was one of the passengers on the first trip down the line. Since those first small beginnings, this first crude railway of nine miles, the railway system of the United States has grown to be the most powerful instrument of progress of our day, with its 95,000 miles of iron track netting the whole surface of the country and carrying wealth into almost every locality. Side by side with this wonderful material development, Mr. Roberts grew into eminence as an engineer. From his first beginning as a chainman, just one year before the first crude attempt at railway engineering, his career was one of steady, substantial growth until the closing hours of his life, crowned with the highest honors which his profession could bestow upon him, and ennobled by works whose perfection and usefulness will be an imperishable record of his worth and fame.

In the course of his long career of fifty-six years as an engineer, Mr. Roberts held so many and so varied positions of trust and responsibility that a bare enumeration of them would require more space than this brief sketch will admit. The more important of them may be summarized as follows: In 1829 Mr. Roberts' connection with the construction works of the Union and Lehigh canals was brought to a termination. In 1830 he was appointed resident engineer of the Union railroad and a feeder of the Union canal. From 1831 to 1834 he was senior principal assistant engineer on the Allegheny Portage railroad, during which time he had charge of repairs on the western division of the Pennsylvania State canal—from Johnstown to Pittsburgh—which had been damaged by the great flood of 1832. In 1835, in his 26th year, he received his first appointment as chief engineer, being called to fill that position on the Harrisburg and Lancaster railroad. In 1836 he accepted the chief engineership of the Cumberland Valley railroad which he held during that year and a part of 1837. During this time he planned and built the first combined railway and

common road bridge, which crossed the Susquehanna river at Harrisburg. From 1837 to 1841 he filled the office of chief engineer on the Monongahela river improvements, the Pennsylvania State canal construction works, the Erie canal, and the Ohio river improvements. In 1841-42 he was a contractor on the Welland canal (Canada) enlargement. In 1843-44 he was chief engineer for the Erie canal company, and from 1845 to 1847 he was chief engineer and trustees' agent for the Sandy and Beaver canal company, of Ohio. In 1848 he was appointed by the Legislature of Pennsylvania to make a survey to avoid, if possible, the Schuylkill (Philadelphia) inclined plane. In 1849 he declined the chief engineership of the first projected railroad in South America, to accept that of the Bellefontaine and Indiana railroad, of Ohio, where he remained until 1851. From 1852 to 1854 he was chief engineer of the Allegheny Valley railroad, consulting engineer for the Atlantic and Mississippi railroad, contractor for the whole of the Iron Mountain railroad, of Missouri, and chairman of a commission of three appointed by the Pennsylvania Legislature to examine and report upon routes for avoiding the inclined planes of the old Allegheny Portage railroad. From 1855 to 1857 he was contractor for the entire Keokuk, Des Moines and Minnesota railroad, consulting engineer for the Pittsburgh and Erie, and Terre Haute, Vandalia and St. Louis railroads, and chief engineer of the Keokuk, Mt. Pleasant and Muscatine railroad.

In December, 1857, Mr. Roberts sailed for Brazil to examine the route of the Dom Pedro II railway with the purpose of bidding for its construction. In 1858, as the senior member of a firm of American contractors, he concluded a formal contract in the United States with the Brazilian minister, Sr. Carvalho de Borges, for the construction of this road, and in the following year he returned to Brazil and took active charge of the work. He remained on the work, which exhibits some of the finest railway engineering and construction in the world, until the completion of the contracted work in 1864. During the remainder of 1864 and a part of 1865 he visited various railways and public works in Brazil and the Platine republics, returning to the United States in the latter part of 1865.

Soon after his arrival in the United States Mr. Roberts took charge of the surveys for the Atlantic and Great Western railroad, which he completed in April, 1866. After some miscellaneous work in the West, he was appointed in 1866 by the Secretary of War, Edwin M. Stanton, as United States civil engineer-in-charge of the Ohio river improvement, which position he held until 1870, when he resigned to accept the chief engineership of the Northern Pacific railroad. In 1868-69 he held, also, the position of associate chief engineer of the great bridge over the Mississippi at St. Louis. He retained the position of chief engineer of the Northern Pacific until his departure for Brazil in January, 1879. During his occupation of this last position he examined and reported upon several railways and the water supply of the cities of Pittsburgh and Philadelphia. In 1874 he was appointed by the President of the United States as a member of a commission of civil and military engineers to examine and report

upon plans for the improvement of the mouth of the Mississippi river. In 1877 he located the Nictaux and Atlantic railroad in Nova Scotia. During the year 1876 he held the position of vice-president in the American Society of Civil Engineers, and at the close of 1878 he was elected president of that society for the ensuing year.

Toward the close of 1878 Mr. Roberts accepted the appointment of the Brazilian Government for an examination of the ports and water-ways of the empire with reference to their improvement. His contract was for a period of three years, beginning with 1879, only six months of which remained unexpired at the time of his death. He left New York on the 4th of January, 1879, and arrived in this city on the 27th of the same month. He was at once charged with an examination of the port of Santos, and entered upon his new work in the following month of February. This task was completed in June, and on the 31st of August Mr. Roberts set out for an extended examination of the Upper Sao Francisco. He was accompanied on this survey by Prof. O. A. Derby, of the National Museum, Mr. Rudolf Wieser, assistant, and by several young Brazilian engineers. This survey was the most difficult and important one upon which Mr. Roberts was engaged, the field work alone occupying a period of over six months. After a long interval had elapsed, during which time he served on a commission to report upon the new water-works of this city, Mr. Roberts was commissioned with the examination of various northern ports, and in two separate trips made careful surveys of the ports of Pernambuco, Fortaleza, Maranhao, Victoria, Caravellas, and several other small ports.

Very recently he was instructed to examine the port of Rio Grande, but this work was afterwards deferred in order to have an examination made of the Rio das Velhas, province of Minas Geraes, during the season of low water. Accompanied by Prof. O. A. Derby, geologist, and Mr. J. W. de Aguiar, assistant, Mr. Roberts set out on this, his last survey, on the 2d of July, 1881. He was compelled to suspend his journey on the 7th, at a little settlement, or railway surveyors' camp, called Soledade, where an indisposition which had been troubling him for some days, developed into typhus fever. He died on the evening of July 14th, 1881, in the 72d year of his age, and was buried on the following day in the parish cemetery of Caramandahy, seven leagues beyond the city of Barbacena, Minas Geraes.

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*Stated Meeting, January 20, 1882.*

Present, 7 members.

Vice-President, Mr. PRICE, in the Chair.

Letters were received from the Imperial Society of Naturalists of Moscow, dated Dec. 13, 1881, and January, 1882, asking the participation of this Society in the celebration of